

they undergo. Restoration may occur by a retrograde change in the catarrhal products and by absorption, and the collapsed lobules may be again expanded. Often the restoration is partial, and the lung may remain contracted and atrophied at the site of the collapsed lobules. In still other cases the bronchial tubes are dilated, the connective tissue undergoes hyperplasia and thickening, the catarrhal products become caseous, and the collapsed lobules slowly inflame. It is obvious that the duration of such a malady must be subject to great variations. The simplest case of catarrhal pneumonia can hardly be concluded in a less time than two or three weeks. In fatal cases, death may occur in a day or two or within a week. In rapidly fatal cases death is due to such a blocking of the bronchioles that the blood can not be aerated, death occurring in deep coma from carbonic-acid poisoning. In chronic cases death occurs in two modes: by an acute exacerbation; by gradual failure of the vital power, by the changes of catarrhal pneumonia, or the results of chronic inflammation in the collapsed lobules. In a large proportion of cases of catarrhal pneumonia in which recovery takes place, there is not a complete restoration, and hence the production of emphysema in after-years.

Prognosis.—About one half of the cases of catarrhal pneumonia prove fatal. The prognosis must be guarded, not only as respects immediate mortality, but the future prospects of such patients. The more acute the attack the greater the danger of a fatal result, for acuteness in the attack means the collapse of many lobules, and the more extensive the area of disease, the more formidable the case in every aspect. The younger the subject the more dangerous an acute attack is, or indeed any attack of catarrhal pneumonia. Diatheses play an important part in the prognosis, for scrofulous and rachitic subjects are less able to bear up under the inflammation. The prognosis is also much influenced by the bodily state, for the less the power of resistance the more severe the disease.

Diagnosis.—Catarrhal pneumonia may be confounded with bronchitis, croupous pneumonia, acute tuberculosis, and œdema of the lungs. From simple bronchitis, capillary bronchitis is separated by the size of the moist *râles*, by the dyspnoea in the one, its absence in the other; by the signs of consolidation of the lung-tissue in the one, by the absence of such consolidation in the other; and, finally, by the subsequent history so different in the two diseases. Croupous pneumonia is unilateral, or, when bilateral, limited to a certain area; catarrhal pneumonia is bilateral and diffused over both lungs. Besides the difference in the physical signs recapitulated under the head of croupous pneumonia, there is the remarkable difference in the behavior, one being a self-limited disease, the other having no fixed duration. Acute tuberculosis at its onset is characterized by the presence of a capillary bronchitis, so that a differentiation is possible only by a study

of the clinical history and course of the two affections. Œdema of the lungs is accompanied by similar symptoms as regards the dyspnoea and the physical signs; but œdema is not a feverish state, and it is accompanied by albuminuria or some evident cause.

Treatment.—The chief source of danger in catarrhal pneumonia is the universal presence of a viscid secretion, which interferes with the entrance of air and thus prevents proper oxygenation of the blood, and causes collapse of the lobules, indirectly. The agents most useful to diminish the viscosity and favor the excretion of the exudation are the preparations of ammonia. The author has obtained the best results from the carbonate (three to six grains) and the iodide of ammonia (four to eight grains) in solution every two hours. The muriate has been much prescribed for the same purpose, but the iodide and carbonate are more efficient. These should be perseveringly administered. If the symptoms are subacute, the oil of turpentine, eucalyptol, and copaiba are very active in checking the formation and favoring the extrusion of the exudation in the tubes. Of these, probably copaiba is the best, as it may be more energetically pushed than the others. These stimulating expectorants, as they are called, owe their efficacy chiefly to the fact that the volatile oil which they contain is eliminated by the lungs and acts locally. They may be used in the acute cases also, after the subsidence of the most acute symptoms, and at the same time that the ammonia preparations are administered. If there be excessive dyspnoea, notwithstanding the use of these remedies, the accumulated muco-pus must be dislodged by emetics. Apomorphine is the most efficient of the emetics, and can be administered in the way to secure the best effects—by hypodermatic injection. Great care must be exercised in the use of this remedy, since occasionally profound narcotism is produced by it, probably due to the presence of morphine. The author has used the subsulphate of mercury, with most excellent effect, as an emetic in catarrhal pneumonia. Although this is a poisonous substance, no danger need be apprehended from it, since it comes up with the vomited matters. It can be given in from two to three grains at a dose, rubbed up with some sugar. Besides its emetic action, the subsulphate seems to have the power to check the formation of the muco-pus. The repetition of the emetic depends on the state of the case—every few hours it may be administered if the dyspnoea and the cyanosis require it. The immediate result of the emetic action ought to be an improvement in the breathing and lessening of the cyanosis. If the fever is great and the arterial tension high, good results are obtained from the combined use of tincture of aconite-root and tincture of belladonna—two drops of the former and one drop of the latter to a child of two years, every two hours. Continued high temperature demands the use of quinine and digitalis. To a child of two years three grains of quinine and one fourth of a grain of digitalis can be given morning, noon, and even-

ing, until the temperature and pulse are brought within proper limits, when they should be administered at longer intervals. As this disease makes enormous demands on the vital resources, the strength should be maintained by suitable nutrients from the beginning. Alcoholic stimulants are not only borne well, but they are extremely serviceable, and seem to have power to check the exudation. Inhalations are highly useful. The air of the apartment should be kept moist by steam; but, besides this, by means of the atomizer, there should be directed into the fauces a spray of solution of common salt, ammonium chloride, or potassic chlorate. If the spray can not be borne directly into the fauces, at least the atmosphere about the patient should be saturated with it. The air of the room may be filled with the vapor of oils of eucalyptus and turpentine, by heating them with water. These vapors have been found to be very efficacious. When there are much dyspnoea and cyanosis, the inhalation of oxygen gas is an expedient of much value. In the subacute and chronic cases, excellent results are obtained from the persistent use of the iodide of ammonium, conjoined with the administration of the hypophosphites and lactophosphate of lime. Counter-irritation is useful in both acute and chronic cases. During the acute stage mustard-plasters and flying-blisters are serviceable, but the mistake should not be made of applying deeply acting and prolonged counter-irritants, lest the irritability of the organic nervous system be exhausted, and the lesions within promoted. Turpentine-stupes, warm, are generally the most useful application. The tincture of iodine is adapted rather to the subacute and chronic than to the acute form. Among the occasional expedients employed in the treatment of catarrhal pneumonia is the inhalation of oxygen. This gives great relief to the dyspnoea, although it does not modify the morbid process in any way, and the relief is temporary. The author knows of no case in which the inhalations were continued for some time in such cases. The inhalation of turpentine-vapor might be carried on by disengaging the vapor in the apartment occupied by the patient. A local action of some value might thus be obtained, since it is apparent that the effect of this agent at the point of elimination is the chief source of its utility when administered by the stomach.

PHTHISIS PULMONALIS—PULMONARY CONSUMPTION.

Forms of Phthisis.—From the point of view of the clinical history, three forms of phthisis may be admitted to exist: *The phthisis of caseous pneumonia; tubercular phthisis; fibroid phthisis.* As respects the essential nature of the malady, there is no difference, all these forms being characterized by the presence and development of the *bacillus tuberculosis*. The circumstances under which this organism develops, the systemic state, and accidental conditions, determine

the particular form assumed by the morbid process. In the first case, the symptoms are of a more acute and inflammatory character, the products copious and cheesy in aspect; in the second case, the phenomena are more immediately dependent on the presence and deposition of tubercle; in the third, changes (hyperplasia) in the connective tissue of the lungs succeed to bronchitis, pleuritis, etc.

A special character is imparted to either of these forms of phthisis by such an etiological factor as the dust of certain occupations: for example, the "*miner's lung*," which is very common in the coal regions of Pennsylvania, and other mining localities. Grinders, potters, workers in dust of various kinds, suffer irritation of the lung tissues by the deposition of the fine, hard particles, which may be seen *in situ*, or be detected by microscopic examination, accompanied by less or more pigment. To the changes of phthisis are added these deposits, which color the lung in varying degrees, in some cases to a black tint. In these, as in all other forms of phthisis, the bacillus brings about the changes in structure characteristic of tubercular disease.

1. CASEOUS PHTHISIS.

Definition.—Caseous phthisis is that form of pulmonary consumption characterized by the caseation, or cheesy degeneration, of inflammatory products in the lungs, and the subsequent softening and extrusion of the caseous matter, with greater or less destruction of the pulmonary tissue.

Etiology.—The chief factor in the etiology of caseous phthisis is catarrhal pneumonia, especially of the apex, although it may be in any part of the lung. There must, however, be bodily conditions which favor the transformation of the catarrhal products, and the deposit and pullulation of the bacillus tuberculosis, since only a portion of the cases of catarrhal pneumonia undergo such transformation. These bodily conditions are a strumous constitution, or a state of lowered health, produced by the operation of various evil hygienic influences. The strumous or serofulous diathesis is characterized by these peculiarities: a tendency to protracted suppuration and the production of a watery and ichorous pus, from slight injuries, and having little or no disposition to terminate, but rather to continue; and the occurrence of glandular enlargements. When in such a type of constitution a catarrhal process is set up in a part of the lungs, the products of such process, instead of undergoing resolution or some form of organization, caseate or become transformed into caseous material, and this becomes a nidus for the development of the bacillus, or the growth of the bacillus brings about the caseation of the products of the catarrhal inflammation. We have in this fact an explanation of the frequent association of measles and consumption. Some of the cases affected to the same extent with catarrhal pneumonia get well, because there

is no underlying constitutional state to invite other diseases; some pass into caseous pneumonia and phthisis, because they are tainted with the strumous diathesis; in a small number acute miliary tuberculosis develops. A strumous diathesis, not inherited, may be gradually acquired under the influence of bad hygiene—as living in a dark, damp, and foul habitation, with insufficient and improper food, and exhausted by overwork, anxiety, etc. If such influences are not sufficient to develop the strumous diathesis, at least they cause a bodily state in which caseation readily takes place in the inflammatory products of catarrhal pneumonia. Caseous phthisis is comparatively common in early life, because at this period measles, whooping-cough, and catarrhal pneumonia frequently occur. It may happen at any period, but is more common up to thirty-five than subsequently. As regards sex, the liability to this form of phthisis, it seems to the author, is greater in the female.

Pathological Anatomy.—In the description of the pulmonary lesions of catarrhal pneumonia, it was shown that the alveoli of the lungs are crowded with cells, and that the bronchioles are filled with yellowish muco-pus. The part which the epithelium of the alveoli takes in these changes is disputed. According to Rindfleisch this pavement epithelium undergoes desquamation and other changes. “The cells first become looser, their attached surfaces are covered with a thick layer of finely granular protoplasm; at the same time in each cell the nucleus, which was before hardly visible, becomes swollen and is segmented. Thus are formed large granular epithelial cells, with rounded polygonal contours, and containing one or more nuclei.” According to Buhl, the alveoli not containing a mucous membrane can not undergo the catarrhal process, and, therefore, the cells which so crowd the alveoli must be drawn or sucked into them. Besides the cellular elements filling the bronchioles and alveoli, an enormous infiltration of cells takes place into the intervening connective tissue—“many of them with two nuclei, nearly all with several surfaces, flattened.” When this infiltration of cells has reached the point of distending the septa between the alveoli, the vessels are so compressed that the circulation in them is suspended. Hyperplasia of the connective tissue, although denied by Rindfleisch, does take place according to other investigators, and, in contracting, considerable shrinkage occurs, and a dense homogeneous mass results, made up of the distended alveoli, the infiltrated septa, the bronchioles dilated and filled with muco-pus and the contracting connective tissue, and is now in a condition preparatory to the cheesy transformation. The caseous change consists in absorption of the watery parts, the fatty degeneration of the cellular elements, and granular disintegration of the fibrinous material, so that ultimately a soft solid is produced, yellowish in color, and having the appearance of cheese. In the mass are inclosed all the pulmonary elements—the acini, the bronchioles, the vessels, etc. “These

nodules are surrounded by atelectatic, œdematous, or gelatinous parenchyma in the preliminary stage of desquamative [catarrhal] pneumonia.” The position of the catarrhal pneumonia resulting in the changes described is usually at the apex, but precisely the same alterations

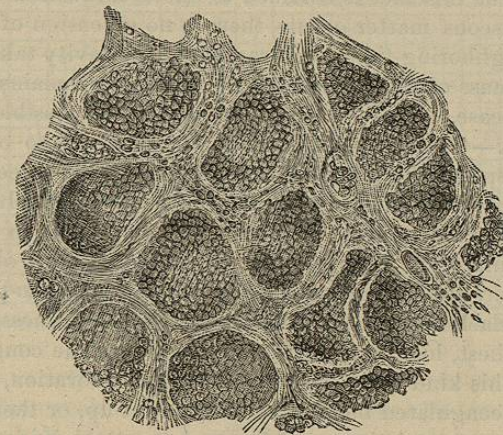


FIG. 32.—Caseous Pneumonia. (Thierfelder.)

occur in other parts. They may result from a general catarrhal bronchitis which has subsided elsewhere, but usually the disease is of the subacute form already described in the previous section, and limited, as it has a great tendency to be, to the apices or to an apex. Sometimes a whole lobe, a whole lung (phthisis florida), becomes infiltrated, and undergoes the cheesy degeneration. The softening in these cheesy nodules or masses begins in the center, and consists at first of a central cavity and softened canals extending from the center to the periphery. According to Rindfleisch, the cheesy masses in the lumina of the bronchi are the first to soften, while that in the peribronchial and perivascular spaces resists the softening process for some time. The force exerted in respiration, the dilatation of the bronchi, and the contraction of the parenchyma of the lungs, are the agencies which procure extrusion of the detritus. Larger cavities are formed by the breaking down of the divisions between smaller ones. The shape, size, conformation, and appearance of cavities vary with their age. The admission of air sets up putrefactive changes, and, instead of an odorless, softened caseous matter, it becomes a foul, greenish, or grumous matter. When this is mixed with the sputa, elastic fibers are detected in it, and the yellowish-gray solid particles containing the bacillus, which are so characteristic a feature of the expectoration. At first, the interior of the cavity is irregular, rough, and is more or less full of disintegrating pulmonary tissue and projecting caseous material; but, when all this is discharged, it is smooth, and lined with a connective-tissue membrane, which furnishes a quantity of puriform fluid. If accumulation of the purulent con-

tents of the cavity takes place, putrid decomposition occurs, and the pus becomes fetid. Hæmorrhage may be produced by erosion of a branch of the pulmonary artery. This accident would be much more common, if it were not that the vessels are early closed and cease to be pervious. In rare cases the mischief is confined to one or a few localities; extrusion of the caseous matter occurs, there is no extension of the morbid process to neighboring tissue, contraction of the cavity takes place, and ultimately a mass of rather loose connective tissue remains to mark the site of the disease. This is the only mode of cure possible.

Symptoms.—Caseous phthisis does not conform to one mode of onset. As respects the initial symptoms, there are three types—the chronic, the subacute, and the acute, or *phthisis florida*. In the chronic form, the onset is so gradual that the first symptoms can not be fixed on with certainty. A susceptibility to colds has been observed, and gradually a persistent cough and expectoration of muco-pus are complained of. Each severe cold is accompanied by chilliness, some fever, pains in the chest, loss of appetite, and a troublesome cough. During an attack of this kind there may be bloody expectoration, or a mouthful or two of coagulated blood may be brought up, or there may be a smart pulmonary hæmorrhage. After such an attack it is observed that the "cold" does not get well; that the cough and expectoration persist, that there are a daily morning chilliness, an evening fever, and a sweat some time during the night. A considerable loss of flesh is now observed, and there are great weakness and a feeling of exhaustion on slight exertion; the appetite is poor, digestion is feeble, and, if a female, the catamenia are becoming scanty. In the subacute variety the onset is not so gradual. There is a history of a severe cold, with pain in the chest, a considerable fever, a troublesome cough, and abundant expectoration. The attack is severe enough to require confinement to bed for a few days, and, although after a week or two some improvement slowly takes place, and the patient gets about again, the symptoms continue; there are fever, some sweating at night, a persistent cough, pains in the chest, expectoration at first of frothy mucus, then of muco-pus; emaciation goes on and the strength does not improve; the appetite is indifferent. In a portion of these cases, after the catarrhal products have become caseous, there is a period of comparative repose, in which all the symptoms appear less severe. The cough lessens, the fever declines, the appetite improves, and a notable gain in flesh may ensue. Under such circumstances the patient, and physician also, may feel greatly encouraged; but none of the physical signs indicating consolidation of the caseous area change their significance, and the symptoms of improvement prove delusive. Presently the process of softening begins (after some weeks, even many months), and with the softening, destruction of the pulmonary parenchyma and the formation of cavities. Caseous phthisis may come on in an apparently healthy individual—it may be in a robust subject, of a full habit. In

a few months a marked decline in strength, flesh, and activity has occurred—all dating from the time of the acute cold (catarrhal pneumonia), since which the symptoms of pulmonary trouble have persisted.

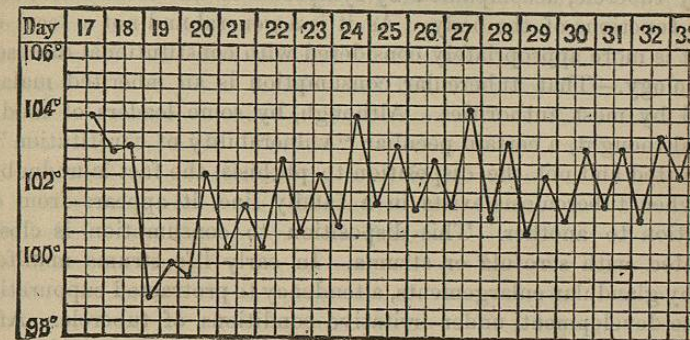


FIG. 33.—Temperature of Catarrhal Pneumonia becoming caseous.—Phthisis Florida.

In the acute variety, or *phthisis florida*, the whole course of the disease is run in a few weeks. It begins as a catarrhal pneumonia, involving almost the whole of one or parts of two lungs. It commences rather abruptly, with chilliness, fever, cough, pain in the chest, and rapid loss of strength. The temperature runs very high during the exacerbations, to 104°, 105° Fahr., or even higher, and there are considerable remissions and profuse and exhausting sweats. Owing to the sudden obstruction of so much of the breathing-space, there is marked dyspnoea. The cough is very troublesome, preventing sleep, and the expectoration is profuse, purulent in character, and often streaked with blood or bloody, but has not the rusty appearance of the sputa of croupous pneumonia. The body emaciates rapidly, the strength is soon utterly gone, and the appetite is entirely absent. The symptoms increase in intensity, so that in the course of a few weeks or months the case terminates in death. Rarely a remission in all the symptoms takes place, an improvement in the local and general condition follows, and thereafter the case pursues a more chronic form. In these cases of *phthisis florida*, a large part of one lung or parts of the two lungs are occupied with the catarrhal pneumonia, and the products of the inflammation undergo caseous degeneration, so that after death a lung may be a mass of cheesy deposit.

2. TUBERCULAR PHTHISIS.

Definition.—Tubercular phthisis is that form of pulmonary consumption characterized by the deposit of gray tubercle; by the changes due to such deposit, its softening and extrusion, and the less or greater destruction of the proper tissue of the lungs consequent on these pro-

cesses. Tubercular deposit in these cases, if not limited to, is chiefly in the lung, and the disease of the lung-tissue quite overshadows that of any other organ. Acute tuberculosis is a general deposit of the miliary tubercle, accompanied by symptoms of universal disturbance of the functions of the body. As it is a general and not a local disease, it is more appropriately considered with constitutional diseases.

Etiology.—That tubercular consumption is an inherited malady, is held by most authorities. Although, by some leaders of modern medical thought, a certain peculiar "vulnerability of constitution" is transmitted and not the disposition to phthisis, the fact is undoubted that, when tuberculosis exists in a family line, it appears from one generation to another. This disposition to consumption is closely associated with scrofula or struma. In early life struma manifests itself by glandular enlargements, a tendency to protracted suppuration, and the development, under irritative conditions, of tubercle. After puberty, the tendency of the strumous constitution is to tubercular deposit in the lungs. One of the factors in determining tuberculosis

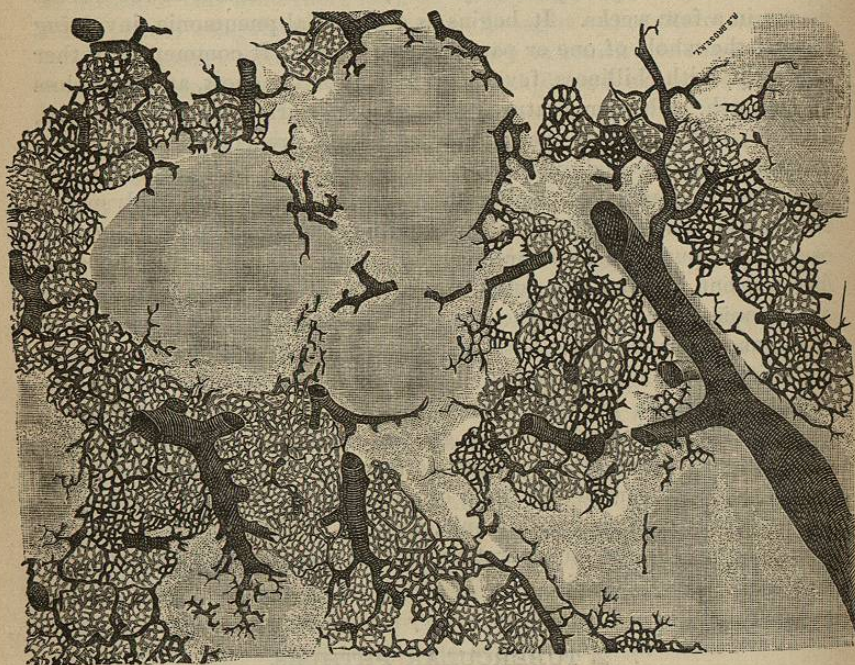


FIG. 34.—Miliary Tuberculosis. (Thierfelder.)

of the lungs is a badly formed thorax. The position at the apex, the favorite seat of tubercular deposit, may be due to the imperfect respiration at this point, owing to its position and conformation. All the

conditions which depress the bodily forces favor the growth and deposit of tubercle. Confined and foul air, excess of humidity, and rapid variations of temperature, are very influential elements in the sum of causes. Living and sleeping in badly ventilated apartments impair the quality of the blood, and invite disease to the lungs. A direct relation has been ascertained to exist between the amount of consumption in a given locality and the humidity of the air. Bowditch first ascertained this for Massachusetts, and the same fact was also shown in England. Variability of climate and rapid and extreme atmospherical vicissitudes have a most injurious effect on those having a tubercular diathesis. Elevation and dryness are as conspicuously beneficial as the opposite conditions are hurtful to those having a phthisical tendency.* The absence of sunlight, by contributing to anæmia, also favors the development of tuberculosis. Improper and insufficient food is an influential factor. The repugnance to fat, which is so often manifested by the phthisical, is unfortunate, since it is so necessary as a force-furnishing food. "Is phthisis communicable?" is a question much disputed, but which seems supported by many affirmative examples. The first experiments with the inoculation of tubercle, by Villemin, apparently proved its specificity, but subsequent researches rather diminished the confidence of those who adhered to this view, since it was shown that various kinds of animal and vegetable matter, especially when decomposing, produced the same results in certain animals when introduced under the skin or inserted into any of the tissues. It was soon maintained that it was the peculiar characteristic of the animal to produce tubercle on irritation, rather than the specificity of the tubercle-matter itself. Rabbits and Guinea-pigs are the animals especially which were found to possess the peculiarity that tuberculosis develops when any form of suppuration is induced in them. It came to be held, then, that certain individuals are, in respect to the development of tuberculosis, like these animals: when subjected to suppurative inflammation, especially in the glandular system, tuberculosis results. It is now maintained, however, that there is nothing specially characteristic in the histological structure of miliary tubercle. There are nodules of syphilis, of lupus, etc., that can not be distinguished in respect to minute structure from the nodules of tuberculosis; but the latter differ from the former in being specifically infectious. Thus, it has been clearly shown that general tuberculosis can be induced in animals by mixing tuberculous matter with the food eaten by them, and by causing them to inhale the sputa from tubercle-cavities. Probably the most conclusive proof of the infectious nature of true tubercle is afforded by

* See Lombard, "Traité de Climatologie Médicale," etc., tome iv, Paris, Baillière et fils, 1880, p. 404, *et seq.*